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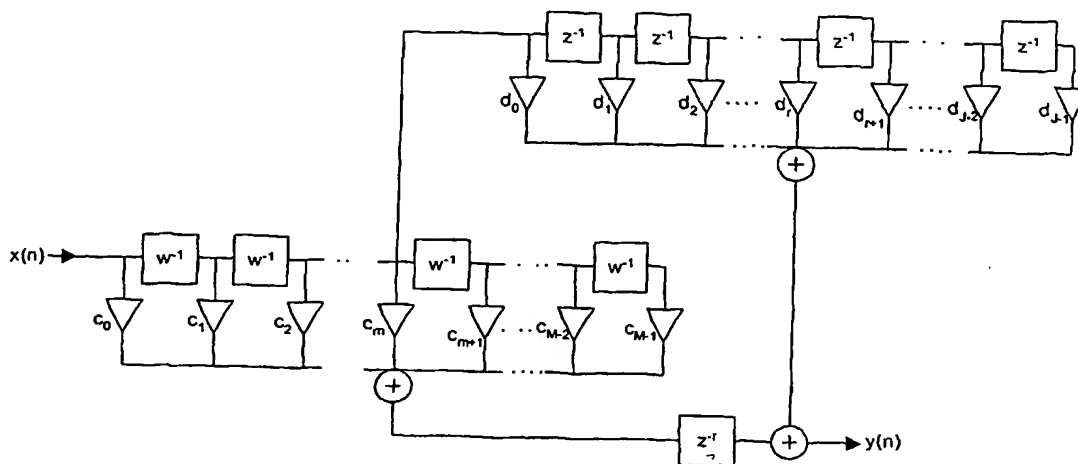
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(54) Title: DIGITAL FILTER AND LISTENING DEVICE



(57) Abstract: The invention concerns a digital filter. The filter comprises at least a first and a second 5 delayed summation line, whereby one of the delay lines comprise a warped filter FIR filter and the other line is a FIR filter, whereby: at least two delayed summation lines are present, midpoint elements from the first delayed summation line are used as input to the second delayed summation line, output from the first delayed summation line is delayed with a delay corresponding to the total delay of the second delayed summation line, the delayed output from the first delayed summation line is added to output from the second delayed summation line to form a new output.

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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04R3/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, COMPENDEX, INSPEC, IBM-TDB

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	HARMA A ET AL: "FREQUENCY-WARPED SIGNAL PROCESSING FOR AUDIO APPLICATIONS" JOURNAL OF THE AUDIO ENGINEERING SOCIETY, AUDIO ENGINEERING SOCIETY. NEW YORK, US, vol. 48, no. 11, November 2000 (2000-11), pages 1011-1031, XP001177399 ISSN: 0004-7554 cited in the application paragraph '0002! paragraph '03.3!	1-5
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☒ Further documents are listed in the continuation of box C.

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INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>HARMA A: "Implementation of frequency-warped recursive filters" SIGNAL PROCESSING, AMSTERDAM, NL, vol. 80, no. 3, March 2000 (2000-03), pages 543-548, XP004188172 ISSN: 0165-1684 abstract paragraph '0002!</p>	1
A	<p>WANG PENG ET AL: "Multiband warped filter equalizer design for loudspeaker systems" IEEE, vol. 2, 5 June 2000 (2000-06-05), pages 913-916, XP010504872 ICASSP 2000 abstract paragraph '0001! figure 6</p>	1
P, A	<p>KATES J M ED - MATTHEWS M B (ED) INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS: "Dynamic-range compression using digital frequency warping" CONFERENCE RECORD OF THE 37TH. ASILOMAR CONFERENCE ON SIGNALS, SYSTEMS, & COMPUTERS. PACIFIC GROOVE, CA, NOV. 9 - 12, 2003, ASILOMAR CONFERENCE ON SIGNALS, SYSTEMS AND COMPUTERS, NEW YORK, NY : IEEE, US, vol. VOL. 1 OF 2. CONF. 37, 9 November 2003 (2003-11-09), pages 715-719, XP010701136 ISBN: 0-7803-8104-1 abstract paragraph 'INTRODUCTION!</p>	1
A	<p>TYRIL M ET AL: "DIGITAL FILTERS FOR LOW-FREQUENCY EQUALIZATION" JOURNAL OF THE AUDIO ENGINEERING SOCIETY, AUDIO ENGINEERING SOCIETY. NEW YORK, US, vol. 49, no. 1/2, January 2001 (2001-01), pages 36-43, XP001112483 ISSN: 0004-7554 paragraph 'INTRODUCTION! paragraph '01.2! paragraph '0004!</p>	1

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INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>KARJALAINEN M ET AL: "Warped filters and their audio applications" APPLICATIONS OF SIGNAL PROCESSING TO AUDIO AND ACOUSTICS, 1997. 1997 IEEE ASSP WORKSHOP ON NEW PALTZ, NY, USA 19-22 OCT. 1997, NEW YORK, NY, USA, IEEE, US, 19 October 1997 (1997-10-19), page 4pp, XP010248220 ISBN: 0-7803-3908-8 abstract; figure 1</p>	1

INTERNATIONAL SEARCH REPORT

information on patent family members

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